FEDERAL AVIATION AGENCY

Washington 25, D.C.

TECHNICAL STANDARD ORDER

Regulations of the Administrator

. Putt 514

Subject: FUEL DRAIN VALVES

TSO-C76

Technical Standards Orders for Aircraft Materials, Parts and Appliances

Part 514 which contains minimum performance standards and specifications for materials, parts, and appliances used in aircraft consists of two subparts. Subpart A contains the general requirements applicable to all Technical Standard Orders. Subpart B contains the technical standards and specifications to which a particular product must conform.

ANY TECHNICAL STANDARD ORDER MAY BE OBTAINED BY SENDING A REQUEST TO FAA, WASHINGTON 25, D.C.

Subpart A-GENERAL

§514.0 Definition of terms.

As used in this part:

(a) "Administrator" means the Administrator of the Federal Aviation Agency or any person to whom he has delegated his authority in the matter concerned.

(b) "FAA" means Federal Aviation Agency.

(c) "Manufacturer" means a person who controls the design and quality of an article produced under the TSO system, including all parts thereof and processes and services related thereto obtained from outside sources.

(d) "Article" means the materials, parts, or appliances for which approval is required under the Civil Air Regulations for use on civil aircraft.

* & **Basis and purpose.**

(a) *Basis.* Section 601 of the Federal Aviation Act of 1958, and §§ 3.18, 4.31, 4b.18, 5.18, 6.18, 7.18, 10.21, 18.18, and 14.18 of this title (Civil Air Regulations).

(b) *Purpose.* (1) This part prescribes in individual Technical Standard Orders the minimum performance and quality control standards for FAA approval of specified articles used on civil aircraft,[1] and prescribes the methods by which the manufacturer of such articles shall show compliance with such standards *in order to* obtain authorization for the use *of* the articles on civil aircraft.

(2) The performance standards set forth in the individual Technical Standard Orders are those standards found necessary by the Administrator to assure that the particular article when used on civil aircraft will operate satisfactorily, or accomplish satisfactorily its intended purpose under specified conditions.

§514.2 TSO authorization.

(a) *Privileges.* No person shall identify an article with a TSO marking unless he holds a TSO authorization and the article meets the applicable TSO standards prescribed in this part.

(b) *Letters of acceptance issued prior to July 1, 1962.* An FAA letter of acceptance of a statement of conformance issued for an article prior to July 1, 1962, is an authorization within the meaning of this part and the holder thereof may continue to manufacture such article without obtaining an additional TSO authorization, but shall comply with the requirements of § 514.3 through § 514.10.

(c) *Application.* The manufacturer or his duly authorized representative shall submit an application for a TSO authorization together with the following documents (See Appendix A of this subpart for sample application) to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, in the region in which the manufacturer is located:[2]

(1) A statement of conformance certifying that the applicant has complied with the provisions of Subpart A and the article meets the applicable performance standards established In Subpart B of this part (See Appendix B of this subpart for sample statement *of* conformance);

(2) Copies of the technical data required in the performance standards set forth in subpart B of this part for the particular article;

(3) A description of his quality control system in the detail specified in § 1.36 *of* this title (Civil Air Regulations). IA complying with this provision the manufacturer may refer to current quality control data filed with the Agency, as a part of a previous application.

NOTE: When a series of minor changes in accordance with § 514.5 is anticipated, the manufacturer may set forth in his application the basic model numbered article with open brackets after it to denote that suffix change letters will be added from time-to-time e.g., Model No. 100 ( ).

(d) *Issuance.* (1) Upon receipt of the application and adequate supporting documents specified in paragraph (c) of this section to substantiate the manufacturer's statement of conformance with the requirements of this part and his ability to produce duplicate articles in accordance with the provisions of this part, the applicant will be given an authorization to identify his article with the applicable TSO marking.

(2) If the application is deficient in respect to any requirements, the applicant shall, upon request by the Chief, Engineering and Manufacturing Branch, submit such additional information as may be necessary to show compliance with such requirements. Upon the failure of the applicant to submit such additional information within 30 days after the date of the request therefor, his application will be denied and he will be so notified by the Chief, Engineering and Manufacturing Branch.

NOTE: The applicant will be issued an authorization or notified of the denial of his application within 30 days after the date of receipt of such application or, in the event that additional information has been requested, within 30 days after the date of receipt of such additional information.

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[1] Articles may also be approved and manufactured for use on civil aircraft as a part of the type design of a type certificate for an aircraft engine or propeller.

[2] Regional Offices are located at New York, Atlanta, Kansas City, Fort Worth, Los Angeles, Anchorage.

§ 514.3 Conditions on authorizations.

The manufacturer of an article under an authorization issued under the provisions of this part shall—

(a) Manufacture such article In accordance with the requirements of Subpart A and the performance standards contained in the applicable TSO *of* Subpart B of this part:

(b) Conduct the required tests and inspections, and establish and maintain a quality control system adequate to assure that such article, as manufactured, meets the requirements *of* paragraph (a) of this section and is In a condition for safe operation;

(c) Prepare and maintain for each type or model of such article a current file of complete technical data and records in accordance with § 514.6; and

(d) Permanently and legibly mark each such article with the following information::

(1) Name and address of the manufacturer,

(2) Equipment name, or type or model designation,

(3) Weight to the nearest tenth of a pound,

(4) Serial number and/or date of manufacturer, and

(5) Applicable Technical Standard Order (TSO) number.

§ 514.4 Deviations.

Approval for a deviation from the performance standards established in Subpart B may be obtained only if the standard or standards for which deviation is requested are compensated for by factors or design features which provide an equivalent level of safety. A request for such approval together with the pertinent data shall be submitted by the manufacturer to the Chief, Engineering and Manufacturing Branch of the Region in which the applicant is located.

§ 514.5 Design changes.

(a) By *Manufacturer*—(1) *Minor changes.* The manufacturer of an article under an authorization issued pursuant to the provisions of this part may make minor design changes to the article without further approval by the FAA. In such case the changed article shall retain the original model number and the manufacturer shall forward to the Chief, Engineering and Manufacturing Branch such revised data as may be necessary for compliance with § 514.2(c).

(2) *Major changes.* If the changes to the article are so extensive as to require a substantially complete investigation to determine compliance with the performance standards established in Subpart B, the manufacturer shall assign a new type or model designation to the article and submit a new application in accordance with the provisions of § 514.2(c).

(b) *By persons other than the manufacturer.* *Design changes to* an article by a person other than the manufacturer who submitted the statement of conformance for such article are not eligible for approval under this part, unless such person is a manufacturer as defined in § 514.0 and applies for authorization under § 514.2(c).

NOTE: Persons other than a manufacturer may obtain approval for design changes to a product manufactured under a TSO pursuant to the provisions of Part 16 or the applicable airworthiness regulations.

§ 514.6 Retention of data and records.

(a) A manufacturer holding an authorization issued pursuant to the provisions of this part shall, for all articles manufactured under such authorization on and after July 1, 1962, maintain and keep at his factory:

(1) *A* complete and current technical data file for each type or model of article which shall include the design drawings and specifications. This technical data shall be retained for the duration of his operation under the provisions of this part.

(2) Complete and current inspection records to show that all inspections and tests required to ensure compliance with this part have been properly accomplished and documented. These records shall be retained for at least two years.

(b) The data specified in paragraph (a)(1) *of* this section shall be identified and copies transferred to the FAA for record purposes in the event the manufacturer terminates his business or no longer operates under the provisions of this part.

§ 514.7 Inspection and examination of data, articles or manufacturing facilities.

The manufacturer shall, upon request, permit [illegible] authorized representative of the FM to inspect any article manufactured pursuant to this part, and to observe the quality control inspections and tests and examine the manufacturing facilities and technical data files for such article.

§ 514.8 Service difficulties.

Whenever the investigation of an accident or a service difficulty report shows an unsafe feature or characteristic caused by a defect in design or manufacture of an article, the manufacturer shall upon the request of the chief, Engineering and Manufacturing Branch, report the results of his investigation and the action, if any, taken or proposed by him to correct the defect in design or manufacture (e.g., service bulletin, design changes etc.). If the defect requires a modification or other action to correct the unsafe feature or characteristic, the manufacturer shall submit to the Chief, Engineering and Manufacturing Branch, the data necessary for the issuance of an airworthiness directive containing the appropriate corrective action.

§ 514.9 Noncompliance.

Whenever the Administrator finds that a manufacturer holding an authorization issued pursuant to the provisions of this part has identified an article by a TSO marking and that such article does not meet the applicable performance standards of this part, the Administrator may, upon notice thereof to the manufacturer, withdraw the manufacturer's authorization and, where necessary, prohibit any further certification or operation of a civil aircraft upon which such article is installed until appropriate corrective action is taken.

§ 514.10 Transferability and duration.

An authorization issued pursuant to the provisions of this part shall not be transferred and is effective until surrendered, or withdrawn, or otherwise terminated by the Administrator.

APPENDIX A
SAMPLE APPLICATION FOR TSO AUTHORIZATION

(Date)

(Addressed to: Chief, Engineering and Manufacturing Branch, Federal Aviation Agency, Region.)

Application is hereby made for authorization to use the Technical Standard Order procedures.

Enclosed is a statement of conformance for the article to be produced under TSO–C_____.

The required quality control data [1] are transmitted: (herewith) (under separate cover).

Signed _____

APPENDIX B
SAMPLE STATEMENT OF CONFORMANCE

(Date)

(Addressed to: Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency.)

The undersigned hereby certifies that the article listed below by model, type or part number has been tested and meets the performance standards of Technical Standard Order C_____. In addition, all other applicable provisions of Part 514 of the Regulations of the Administrator have been met.

The technical data required by the TSO in the quantity specified are transmitted: (herewith) (under separate corer).

Authorization to use TSO identification on this article is requested.

Signed _____

[1] Reference may be made to data already on file with the FAA.

§ 514.82 Fuel drain valves - TSO-C76

(a) Applicability. Minimum performance standards are hereby established for fuel drain valves to be used in civil aircraft of the United States. New models of fuel drain valves manufactured on or after the effective date of this section shall meet the standards specified in the Federal Aviation Agency Standard, "Fuel Drain Valves" , dated October 1, 1962.1/

(b) Marking. Articles shall be marked in accordance with the requirements of § 514.3(d) except that:

(1) The size shall be shown in lieu of the weight required by § 514.3(d)(3); and

(2) Parts too small to contain all the required information shall be marked with the TSO number and the manufacturer's name or identifying mark. For such parts, the other marking data required by § 514.3(d) shall be placed on the shipping container of the part.

(c) Data requirements. In addition to the data specified in § 514.2, the manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, the following technical data:

(1) Six copies of an instruction manual describing the product and supplying information on maintenance, overhaul, and installation.

(2) One copy of the manufacturer's test report.

(d) Effective date. March 1, 1963.

1/Copies may be obtained upon request addressed to Publishing and Graphics Branch, Inquiry Section, MS-158, Federal Aviation Agency, Washington 25, D.C.

FAA STANDARD - FUEL DRAIN VALVES

1. PURPOSE: To specify minimum requirements for fuel drain valves that are intended to drain fuel or water from low points in aircraft fuel systems. Fluid discharge from the valve is intended to be drained to a container for inspection.

2. SCOPE: This standard covers the requirements for acceptance of fuel drain valves used as a quick means of draining fuel or water from aircraft fuel systems. These valves are intended to be used in fuel tank sumps, strainers and gascolators.

3. GENERAL REQUIREMENTS:

3.1 Materials. Materials shall be of a high quality which experience and/or tests have demonstrated to be suitable for use with aviation fuels having an aromatic content from 0 to 30 percent. Synthetic rubber parts shall be age dated in accordance with ANA Bulletin No. 438. All metals used In the construction of fuel drain valves shall be of corrosion resisting type or shall be suitably protected to resist corrosion during the normal service life of the valve.

3.2 Design and Construction.

3.2.1 Fuel Spillage. The drain valve shall be designed to permit operation without spillage or leakage of fuel on operating personnel.

3.2.2 Position Indication. Indication shall be provided for the open and closed position of valves. The valve shall utilize detents or other suitable means to retain the valve in the full-closed position. When manually released from the open position, the valve shall automatically return to the closed position.

3.2.3 Self-locking. The valve shall be provided with a means to prevent accidental opening or opening due to vibration or air loads.

3.2.4 Purge. The valve shall be designed so that the inlet pressure does not tend to open the valve, and so that the inlet pressure keeps the valve in the closed and sealed condition.

3.2.5 Loss of Parts. Fuel drain valves shall be designed to preclude the loss of parts. Design consideration shall be given so that the main seal will remain in place and prevent fuel leakage in the event of possible damage to or loss of the valve stem from operational loads to be anticipated in service. If threaded fittings are employed to support the valve, positive design provisions shall be included to prevent operational loads from rotating the valve body out of its boss.

3.2.6 Screens. The design of the valve shall include no features, such as screens or baffles, which could impair the valves effectiveness in draining fuel containing water and other contaminants.

4. TEST CONDITIONS:

4.1 Atmospheric Conditions. Unless otherwise specified, all tests required by this standard shall be conducted at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 25° C.

4.2 Fluids. Unless otherwise specified, commercial grade aviation fuels shall be used for all tests.

5. TEST METHODS AND PERFORMANCE REQUIREMENTS:

5.1 Functional. This test shall demonstrate the ability of the valve to meet the design requirements specified in Sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, and 3.2.5.

5.2 Flow Test. The drain valve shall be connected to a suitable container and the time required to pass a 1 quart quantity of fuel shall be determined when conducted with a maximum head of six inches of fuel. The time to flow 1 quart shall not take longer than 1 minute.

5.3 Leakage Tests.

5.3.1 Fuel Leakage. The fuel leakage test shall be conducted at pressures of four inches of fuel, one p.s.i., 20 p.s.i., and 60 p.s.i. The pressure shall be applied to the drain valve inlet with the valve in the closed position; there shall be no leakage.

5.3.2 Air Leakage. The air leakage test shall be conducted with the valve installed in a suitable test setup so that the valve inlet port is covered by fuel. Air pressure varying from 0 to five p.s.i. shall be applied to the valve outlet port with the valve in the closed position. There shall be no air leakage evident.

5.4 Fuel Resistance and Extreme Temperature. The fuel resistance and extreme temperature tests shall be conducted in accordance with the following table:

Fuel Resistance and Extreme Temperature
Test Schedule

Test	Fuel Resistance		
Period 1/	Phase I Soak	Phase I Dry	Low Temperature
Component configuration	2/	Drained and blown dry, normal condition as would be expected under service conditions, ports open.	Mounted as would be expected under normal service conditions 2/
Test Fluid	MIL-S-3136, type III	None	MIL-S-3136, type I
Period duration	96 hours (4 days)	24 hours	18 hours
Ambient and test fluid temperature.	158° ±2° F, or the normal operating temperature of the system in which the component is used, whichever is higher.	Circulating air at 158° ±2° F. or the normal operating temperature of the system in which the component is used, whichever is higher.	Lower the fluid temperature to -67° ±2° F., then maintain the fluid temperature at -67° ±2° F. for a minimum of 18 hours.
Operation or tests during period.	Actuate component at least 4 cycles per day in a normal manner.	None	None
Operation or tests immediately after period.	Conduct leakage test, using MIL-S-3136, type III fluid. 3/	(a) Actuate components for 5 cycles. (b) Conduct functional and leakage tests, using MIL-S-3136, type I fluid. 3/	With temperature not higher than -65° F., conduct functional and leakage tests, using MIL-S-3136, type I fluid. 3/

1/ Each period shall follow immediately after the preceding one in the order noted.

2/ The component shall be maintained in such a manner as to insure complete contact of all nonmetallic parts with the test fluid as would be expected under normal service conditions.

3/ No leakage is allowed at any time during the test except for the first 15 minutes of the leakage test of the dry cycle.

5.5 Vibration.

5.5.1 Resonance. The valve shall be subjected to a resonant frequency survey of the range specified in the following table in order to determine if there exists any resonant frequencies of the parts. If resonance is encountered, the valve shall be successively vibrated along the three axes for four hours at the critical frequency.

5.5.2 Cycling. The valve, in the closed position, shall be mounted on a vibration device, fluid pressure shall be applied to the inlet port. The valve shall be subjected to the three vibration scanning cycle tests contained in the following table:

Vibration Test

Scanning cycle test	1	2	3
Axis of vibration	X	Y	Z
Fluid pressure	60 p.s.i.a.	60 p.s.i.	60 p.s.i.
Scanning cycle time	15 min.	15 min.	15 min.
Number of scanning cycles per test	2	2	2
Procedure	The vibration test shall be conducted on the valve along three mutually perpendicular axes herein referred to as the X, Y, and Z axes; the X axis being defined as lying along center lines of the valve. The frequency shall be uniformly increased with respect to time through a frequency range from 10 to 500 c.p.s. with an applied double amplitude of 0.036 inch up to 75 c.p.s. and from there an applied vibration acceleration not less than ±10g. The frequency shall be similarly decreased such that the complete cycle is accomplished in the specified cycle time.		

The test shall also be conducted at pressures of ½ p.s.i. and five p.s.i. There shall be no fluid leakage during the test.

The test shall also be conducted with air pressure varying from 0-5 p.s.i. gage at the outlet port. Air leakage shall not exceed 10 cc. per minute of free air during the five p.s.i. air suction test.

There shall be no evidence of damage to the valve or loosening of parts as a result of the test.

5.6 Proof Pressure. The valve shall be in the closed position and shall be subjected to a fuel pressure of 100 ±2 p.s.i. for a period of one minute at the inlet port, with the outlet port open to atmospheric pressure. There shall be no evidence of permanent distortion or other damage to the valve. There shall be no external leakage when the pressure is reduced to 60 p.s.i.

5.7 Reliability Tests. (Cycling Operations)

5.7.1 Dry. valve shall be dried in an oven at 158° ±2° F. for four hours and then, in the dry condition, be subjected to 2,000 complete cycles of operation.

5.7.2 Wet. valve shall be moistened with fuel, supplied with a six inch head of fuel and then be subjected to 6,000 complete cycles of operations

5.7.3 Post Reliability Test. Upon completion of the cycling operations, the valve shall be subjected to the Leakage Test. There shall be no leakage from any portion of the valve as the result of the Reliability Test.